Computing Division Operations

Computer Facility Support

Project Status Report

5/23/06

Topics

- GCC
  - Computer room A
  - Tape robot room
  - Computer room B
  - Projections
  - Monitoring
- LCC
  - Room 108
  - Room 107
  - Projections
- FCC
  - Usage
  - Projections
- Outlook

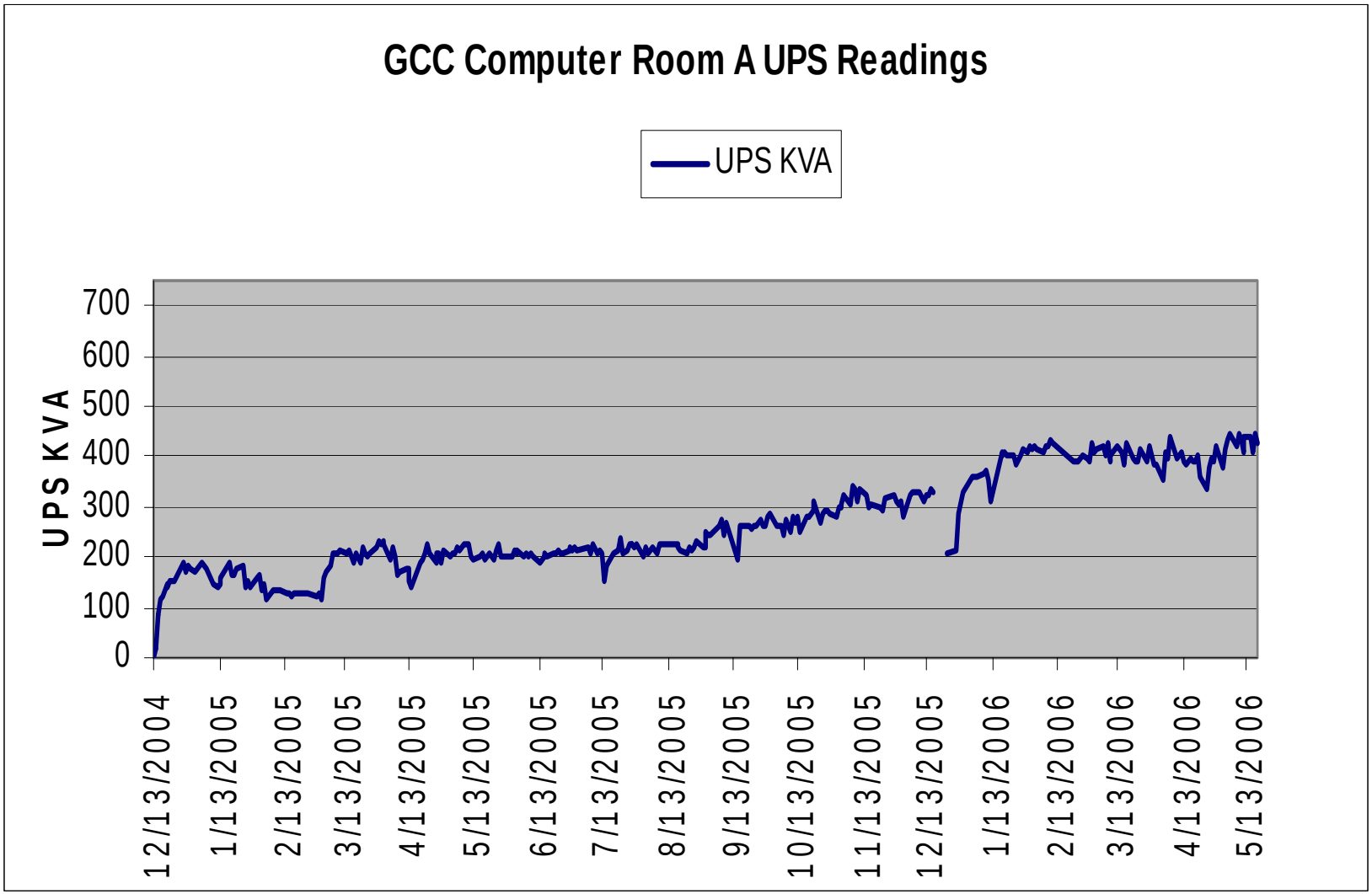
GCC Computer Room A

- Constructed Feb. 2004 – Jan. 2005
- Built for 72 racks of 40 computers each (2880 computers), 840 KW of power & 720 KW of cooling
- 55 racks in room now using 450 KW
- Averaging 80% of projected (10 KW/rack)
- 17 rack spaces & 270 KW cooling remaining

GCC Computer Room A (cont.)

Comment: If the experiments find the money, which they are trying to do, it will get worse -- we will have to find ways to squeeze the additional computers into some part of the facility.

- FY06 acquisition plans
  - CMS: 240 computers (6 racks)
  - CDF: 280 – 320 computers (7 – 8 racks)
  - D0: 280 – 320 computers (7 – 8 racks)
  - GP Farms: 40 computers (1 rack)
  - Total: 20 – 22 racks, meaning 3 – 5 rack spaces short
- So we added electrical for 5 more racks
- Since we are running at 80% projected, we anticipate <720 KW
- Floor space will be essentially full after FY06 acquisitions
- GPP construction cost: $2.2M


GCC Computer Room A UPS Readings
UPS KVA
UPS KVA
700
600
500
400
300
200
100
0
12/13/2004
1/13/2005
2/13/2005
3/13/2005
4/13/2005
5/13/2005
6/13/2005
7/13/2005
8/13/2005
9/13/2005
10/13/2005
11/13/2005
12/13/2005
1/13/2006
2/13/2006
3/13/2006
4/13/2006
5/13/2006

GCC Tape Robot Room

- Construction recently completed
- One STK SL8500 10K cartridge robot in room
- Built for 3 STK robots and 75 mover nodes
- Total tape storage capacity (3 robots)
  - LT03: 12 Pbytes
  - LT04: 24 Pbytes
- GPP construction cost: $795K

GCC Computer Room B Building Addition

Computer Room B will have the same power as A but it will have a 3 foot raised floor.

The floor however will be at ground level.

- Construction just starting
- Building for 84 racks, 840 KW capacity
- New building addition includes network/tech, electrical/UPS rooms and shell for a 3rd computer room

The shell won't have any air conditioning and will only have basic lighting.

- Target beneficial occupancy 11/24/06
- GPP construction budget: $4.6M

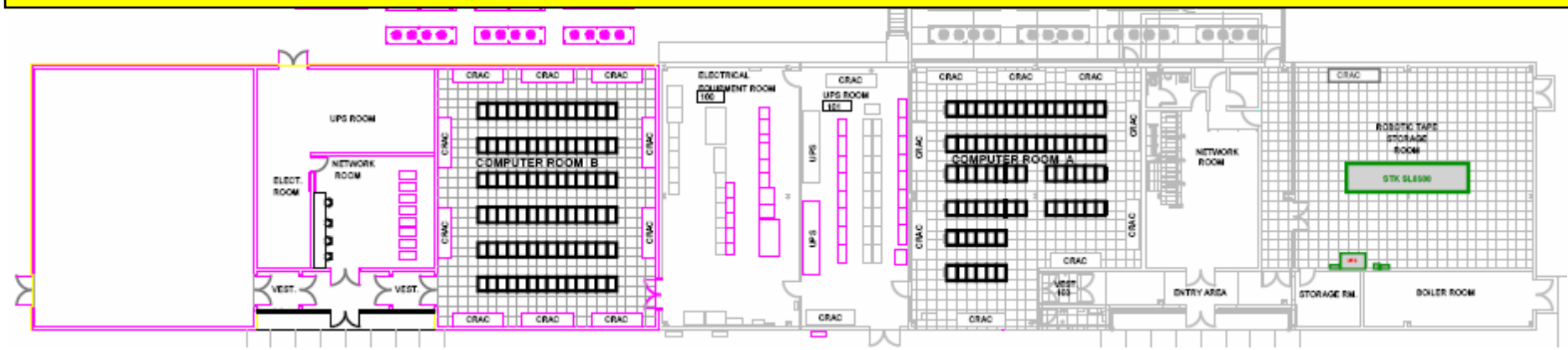
Discussion Related to Slide 11 below: How much of the 840 KVA is available? If Computer Room A can shutdown in 5 minutes, we believe we have 15 minutes of 840 KVA left which can power the systems for a long time. (KC) 40 KVA can last about an hour when powering the Tape Robot.

Discussion: The possibility of running the computer room A with a 120 degree F. for the shut-trip-break was raised in earlier meetings. Consensus (among CMS, DZero, CDF, and General Purpose Farms was to be conservative and stay with 95 degrees F.

(VW) Summary: On an on-going basis this arrangement does not take away from availability for Computer Room A. (SN) Concern about effect of systems using more of the 840 KVA.

Discussion About Normal Running: The UPS in a normal running situation must provided power for CR-A, the Networking/Tech Room and the Tape Robot Room. The more the equipment in the latter two rooms draws power from the 840KVA UPS as opposed to street power source or 40 KVA UPS source, the less power is available for the computers in CR-A. If (or when) those computers are upgraded to dual core's or whatever, the computers in Computer Room A will be limited in the power available to them by the consumption of the networking/tech room and the tape robot room.

(GB) Will go over more in the computer planning meeting.



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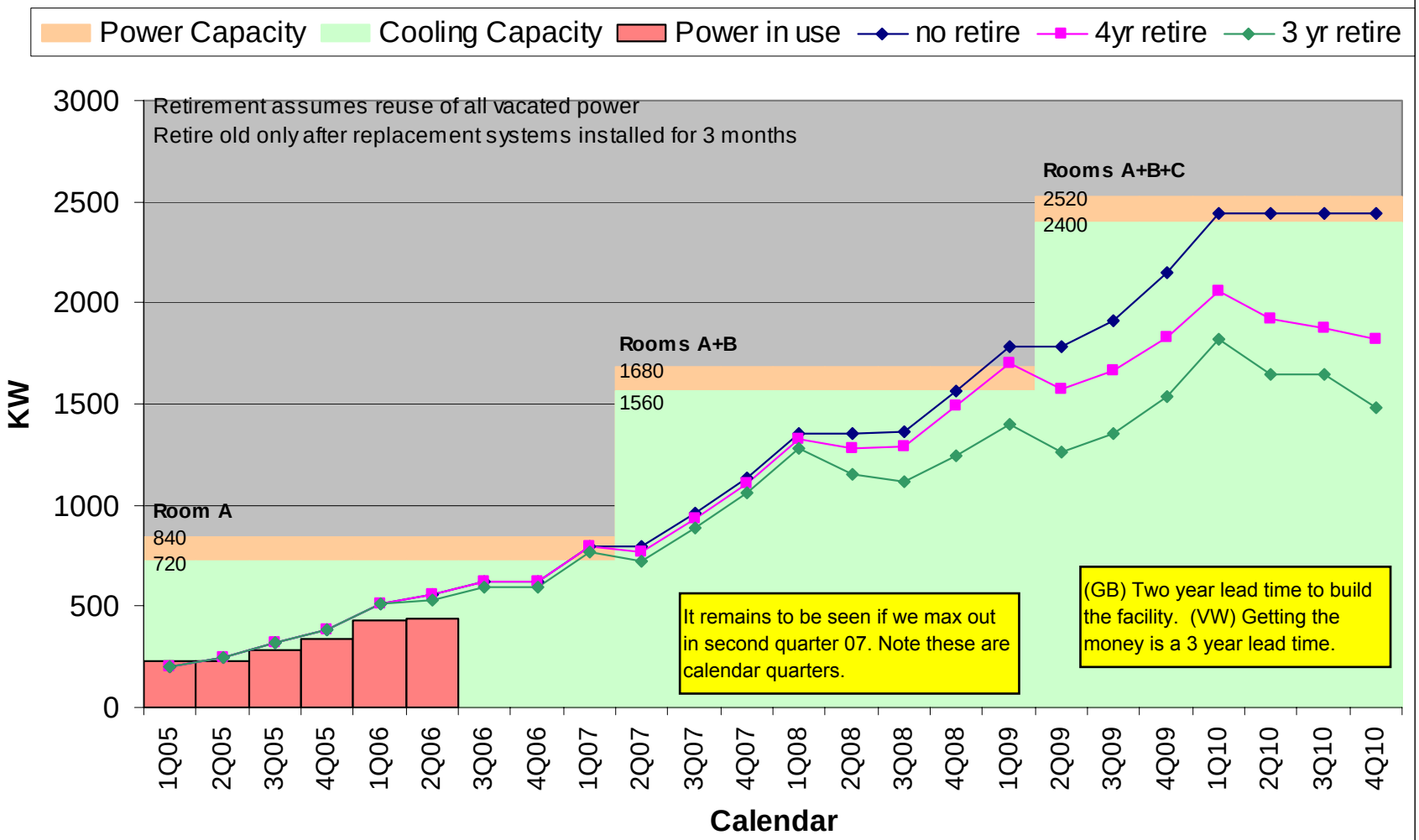
GCC Usage & Projections



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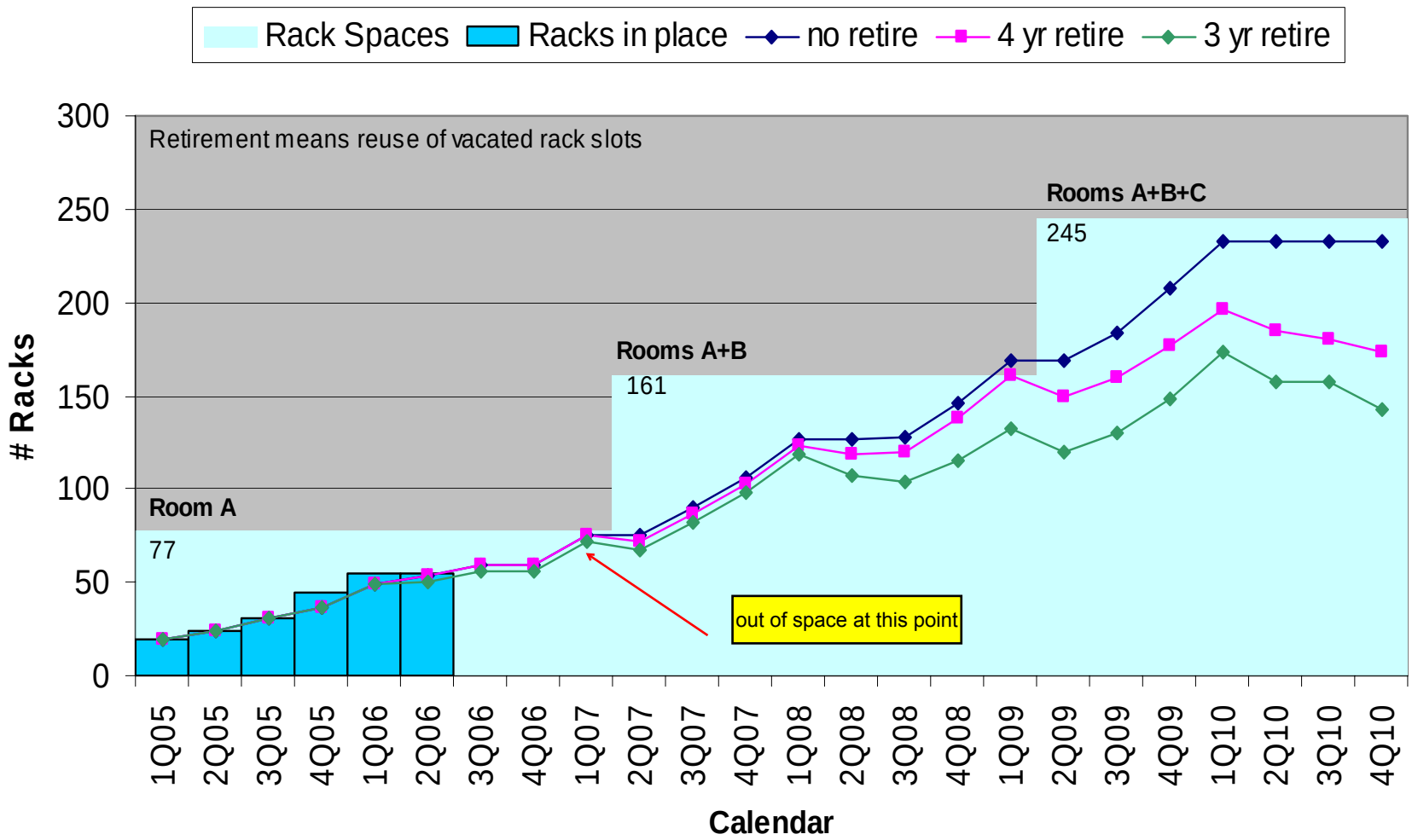
GCC Floor Space Utilization



GCC Power Protection

UPS supports computer room A. (SN) Concerned about giving KVA's away to the robot room. (GB/VW) Purpose of the UPS is to get the system's shutdown. (VW) Goal of the UPS is to tide you over a glitch and to allow an orderly shutdown.

- CRA has 1,000 KVA UPS (840 KW load)
- Networking uses CRA 1,000 KVA UPS and redundant street power

Note: part of the ups is used for charging batteries, etc. (hence, 1000KVA -> 840 KVA)

- CRB and new network room will have same power configuration

See notes of extensive discussion on annotated on Slide 8 above.

- Robot room has 40 KVA UPS + redundant power from CRA 1,000 KVA UPS
- CRA, network & tape robot room can be powered by rental generators
- CRB will also have rental generator backup

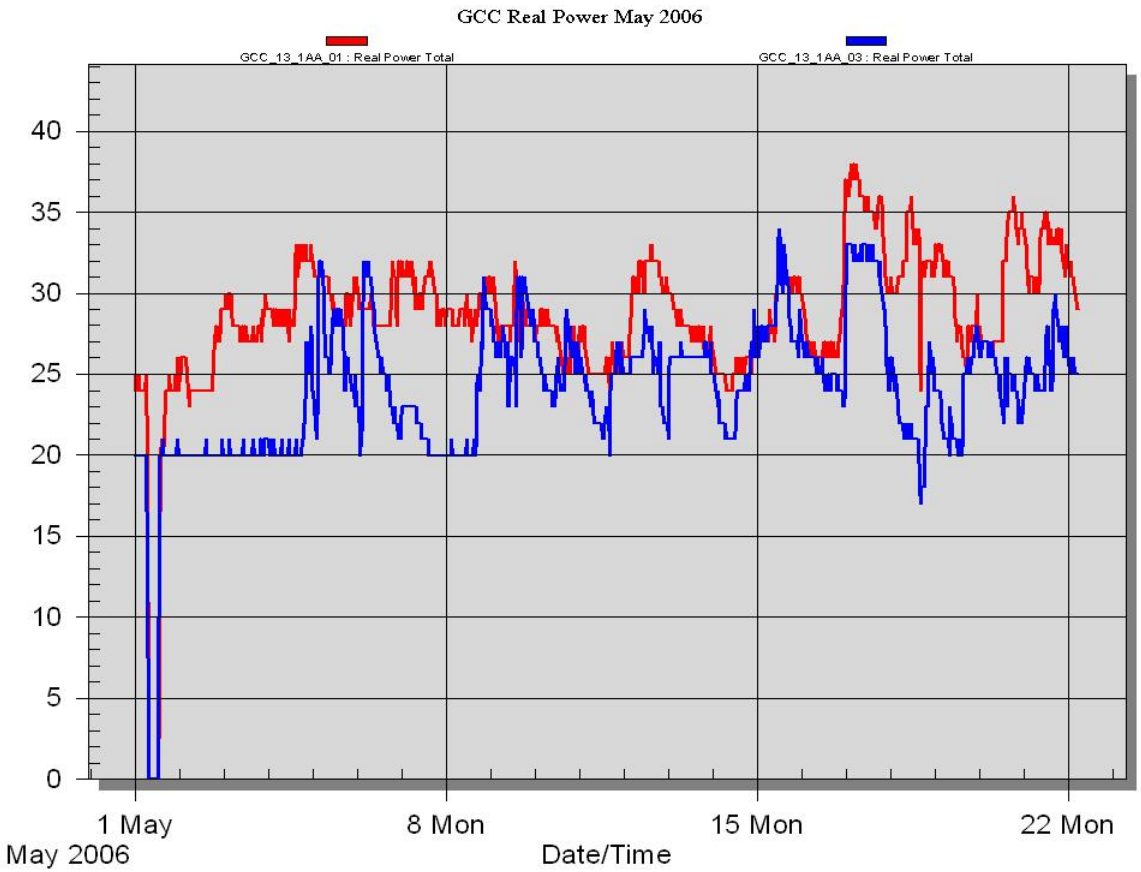
GCC Facilities Monitoring

Discussion of access to Metasys via restrictive FESS rules

- Metasys – monitoring...
  - Most CRAC units except...
    - UPS room second CRAC, tape robot room CRAC; Computer Room A two newest CRAC's (#8, #9)
  - UPS-A
  - Switchboards for CRAC's and CRA panels
  - Roof AC in Network/Tech Room
- Provides general alarms and paging
- Accessible easily only from Ops Office ;-(!

GCC Facilities Monitoring

PowerLogic operational: GCC CR-A example panels (units: 208 amps)



GCC Facility Monitoring

- Temperature and Other Conditions
  - Operational
    - shunt-trip breaker – hard CR-A power-off if 95°F. exceeded
    - UPS for CR-A – on batteries notifies stakeholder equipment
  - Not Operational
    - rack temperature sensors – yet to achieve peaceful coexistence between PowerLogic and Python temperature sensor read-out script

- Cameras
  - deployed in tape robot room, high-bay hallway, entrance way, network/tech, CR-A, UPS room, electrical room
  - 30 day retention

Site Scan Web

- Site Scan Web
  - Status and Plans
    - ordered: s/w (delivered) and h/w (PC)
    - facility maps supplied (for drill-down clickable screen visuals)
    - GCC first, LCC, FCC next
    - expect to deploy in 4 to 6 weeks
  - Approach
    - monitoring – *not* control – only in CD: GCC, LCC, FCC,...
    - allows Ops personnel to monitor from other than Ops Office – maybe even mobile (gasp!) ;-)
    - coexists with Metasys
    - paging and alerts more customized to CD needs

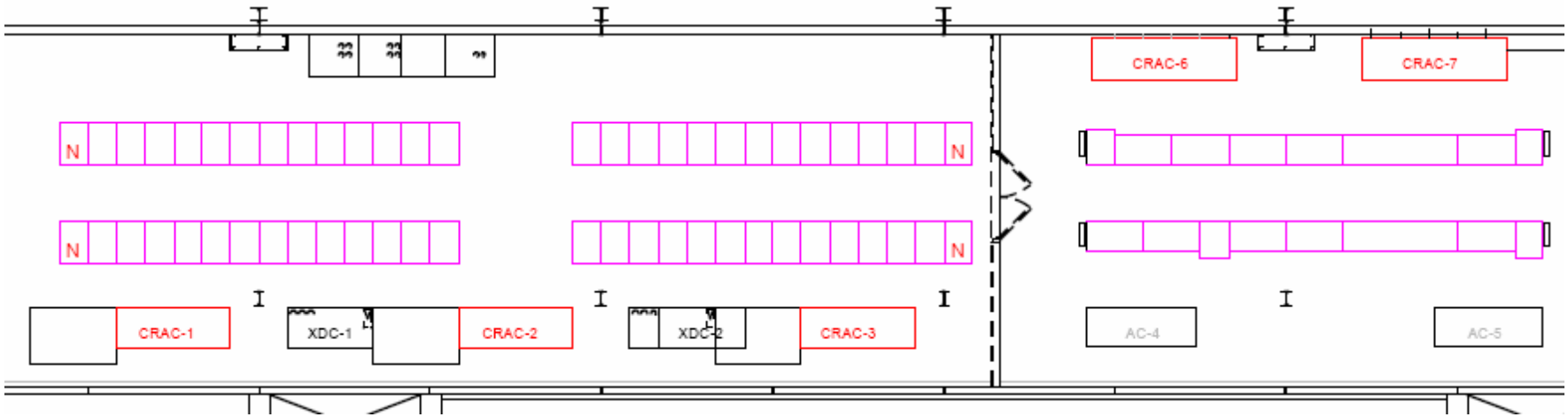
LCC Computer Rooms

- Room 108 (built 2 years ago)
  - Full with 670 LQCD computers
  - No electrical measure yet, but estimate ~120 KW
- Room 107
  - Under construction for 52 racks (2080 computers), 450 KW
  - Target completion 6/16/06
- FY06 acquisition: 1,000 computers
- LCC does not have UPS power protection
- LCC can be powered by rental generators
- GPP construction cost: $1.65M

Computers being acquired are half the planned capability

For Room 107

LCC



FCC Computer Rooms

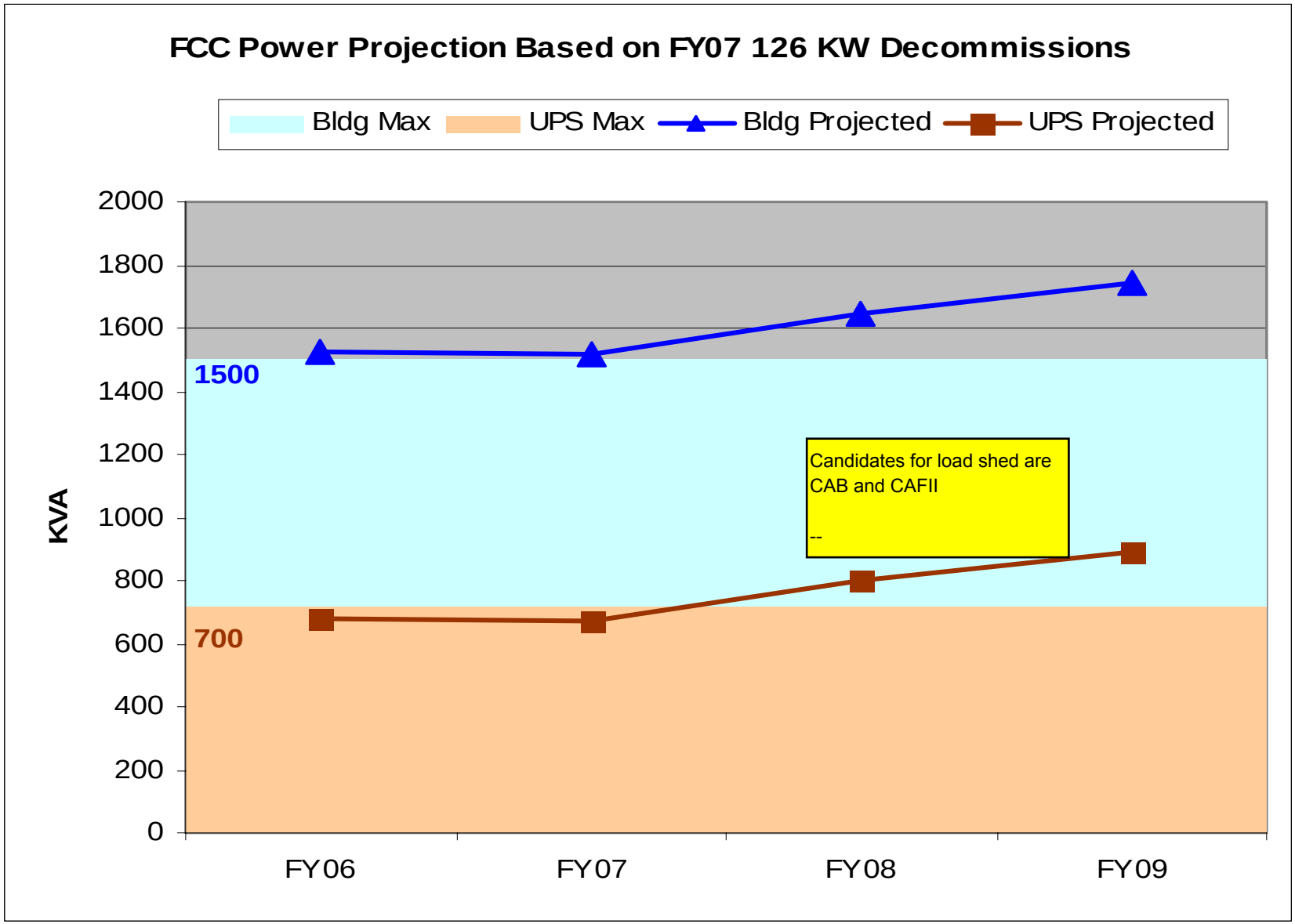
- FCC1, FCC1 Mezzanine (tape robots), FCC2
- Max UPS power available 700 KW across 4 UPS's (500, 60, 2x100 KVA rated)
- Currently running 565 KVA with 135 KVA remaining
- Floor space not an issue
- Partitioned power across UPS's is an issue since each UPS powers different computer room areas

16,000 square feet at FCC.

2,000 square feet at GCC.

FCC Computer Rooms (cont.)

- FY06 acquisitions
  - CMS: 65 KW
  - CDF: 20 KW
  - D0: 20 KW
  - Misc: ?
- FY06 projected power 670 KW
- Will need summer load shed plan since building can consume 800 – 850 KW during summer and generator is limited to 1500 KW
- FY07 projected additions: +126 KW
- We might get through FY07 if we can decommission 126 KW


FCC Power Projection Based on FY07 126 KW Decommissions
Bldg Max
UPS Max
Bldg Projected
UPS Projected
KVA
2000
1800
1600
1500
1400
1200
1000
800
600
700
400
200
0
Candidates for load shed are CAB and CAFII
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FY06
FY07
FY08
FY09

Bottom Lines

- GCC
  - We believe that GCC computer room A will satisfy FY06 additions
  - We believe that computer room B will be ready in time for FY07 additions
- LCC: Room 107 new room will satisfy FY06 LQCD acquisitions with room for 1,000 more computers
- FCC: If we can reduce load by ~126 KW through decommissions, we may make it through FY07, however load shedding may be needed on some days of high heat

Network is only 30 KVA at FCC. Hogs are CDF, DZero and file servers that are coming. (VW) May have to put caching file servers out at GCC or LCC.

(GB) Looked at addition into FCC but was quite expensive -- growth in file servers and disk units have made increase.
(GB) 180 - 200 watts/sq. ft. Could go up to 360 watts/sq. ft. (SN) IU say you can go to 20 KW / rack with cooling on doors. (GB) Think can do 18 KW/rack with top down air cooled. Computer Room B will be a duplicate of Computer Room A because it has been successful. (VW) May have to go to generator at Computer Room B. Discussion about co-location, etc.